Carbon Monoxide Follow-up Meeting

Miami, FL – Miami Boat Show 2004
February 13, 2004

Minutes

Sponsored by:

United States Coast Guard
Office of Boating Safety
Recreational Boating Product Assurance Division

Minutes prepared by:

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ABYC®
Setting Standards for Safer Boating

USCG Follow-up Meeting
Minutes of Meeting
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Moderator Richard Blackman called the meeting to order at 10:00 AM EST.

Appendix A includes all in attendance.

Dick Blackman, Product Assurance Engineer at the United States Coast Guard (USCG) Office of Boating Safety gave some opening remarks about the importance of this issue and an update on the history of Coast Guard initiatives surrounding Carbon Monoxide (CO). The following topics and events summarize where we have been and what we have accomplished:

- October 2003 follow-up meeting in conjunction with IBEX
- Stack exhaust for houseboats
- Size and breadth of the problem is different than first thought
- Media campaign (Al Unser, Brochures, PSAs, Video)
- Rental and Charter organizations are making users aware of CO issues
- Boating safety instructors are teaching the topic
- An Emission Control Device (ECD) is available
- EFI in outboards is effective
- Catalytic converter testing is on-going.
- Interlocks and safety switches have the ability to keep areas out of reach.
- Outdoor CO detectors are possible
- Westerbeke has decreased CO output by 99%
- CO Safe distance study was completed

Mr. Blackman described the new format for the meeting. Past participants and industry were polled for questions to be answered at this meeting. Out of the questions received, four were chosen to be asked of the panel members present. Panelists were chosen based on their ability to answer the questions chosen. Each participant has experience in the area of the question they will be answering.

(NOTE: the format of these minutes will mimic the meeting eg question and answer)

Question (directed to Jeff Wisneiwski, MTI):

When will the technology be available to allow installation of outdoor CO detectors suitable for the marine environment?

Answer: Off the shelf technology exists to create an outdoor Carbon Monoxide detector. The device that MTI is experimenting with has been tested for durability under water (30 cm) and passed tests that simulate the marine environment. This unit could be available in as little as 12-18 months. The particulars of the device still need to be researched (e.g.

type of warning, mounting types, delay, etc.) ABYC A-24 gives direction on an indoor unit. The outdoor unit would differ in many of these requirements and needs to be addressed.

Question: *(Note: Persons asking questions were not asked to identify themselves at this point in the meeting)*
In the cockpit of a boat CO levels can be localized, how would an outdoor detector handle this situation?

Answer: This is an area where a standard would have to be drafted to discuss these issues.

Question: What is the recovery time after dunking the unit?

Answer: 3 minute recovery time from CO exposure.

Question: The aircraft industry uses a colored dot to indicate the presence of CO. Has this type of unit been looked into?

Answer: Not that I am aware of.

Question: Have you looked into installation and size requirements?

Answer: Yes, the unit we are working on would be hard-wired into the electrical system and would be about the size of a half dollar.

Question: Have you looked into a wearable unit?

Answer: No, the unit we are talking about today could only be expected to last a day and ½ as a portable unit when powered by a 9 volt battery.

Observation: The aircraft industry has this "dot" device, more information should be gathered on this, and its possible use in the marine environment. Integration into a PFD could be an interesting project.

The next question was directed to Bob MacNeill of IMCA (International Marine Consulting Associates)

Question: Is interior pressurization or ventilation an option worth considering as a means of mitigating the inside CO poisoning risk?

Answer: Boats are designed with negative pressurization and, essentially, suck in the exhaust as they bring in fresh air to ventilate engine compartments. Detectors and sensors are considered and required, but positive pressurization at this point has not been addressed. Why is this not done on boats? It seems cabins and cockpits could be pressurized passively (vents and ductwork), but an active system may be a better

solution. The station wagon effect is primary concern, the passive system may not work at slow speeds. Issues that come to mind may be air conditioning and heating but these can be worked out. The cockpit itself should be pressurized. This area is enclosed with canvas and often only one rear panel is open. When a forward panel is open, the CO levels drop. Passive systems in cockpits may be as simple as scoops in the canvas. CO meters could be installed at the air inlet in an active system, letting people know that a problem exists in the boat as a whole. Not just in a localized area.

Question: Robert Baron-Have you tested boats with exhaust on the side to avoid the station wagon effect?

Answer: Recently side exhaust on a cruiser was an issue. The side exhaust was pushed into the side vents and deck structures. Stern exhaust pointed down seems to work well in most situations.

Observations:

Dave Montgomery, Bombardier-It seems that excess air should be mixed with the exhaust before it exits the boat to dilute the CO. A blower with at large capacity may be used for this purpose.

Rick Lee, Fineline industries- testing shows that side exhaust on a ski boat does not allow the station wagon effect to occur above 9 mph.

Jim Carrol from Southwest research was asked to respond to the next question: What is the current status and outlook for marine catalytic converters, and will they result in lower CO emissions?

(Note: Due to the proprietary nature of Mr. Carrols presentation, the PowerPoint information presented at the meeting will not be included in these minutes)

The focus of the study is to reduce HC and NOX emissions. Added benefits to the process are reductions in CO levels. Significant reductions are found at the lower speeds and RPM levels. Up to 90% reductions are realized at idle speeds (guessing at less than 15 mph) while the higher speeds see a 10 to 20% reduction. Results should be published mid-summer.

Question: David Marlow, Brunswick Boat Group – The focus currently is HC/NOX, will that focus change to CO?

Answer: The California Air Resources Board is funding this to reduce HC/NOX in order to comply with regulations and has not focused on CO because there are no regulatory actions concerning CO. After attendance at these meetings, I (Mr. Carrol) have been personally looking into CO in relation to this testing.

David Montgomery Bombardier – If there is no mandate on CO then, a much less expensive unit could be employed, possibly an open loop with proper mixing employing an air pump.

Answer: Even with proper mixing in an open loop system CO levels are much higher than a catalyzed exhaust.

Question: David DeHorn, NMMA - Have any dynamometer testing been done comparing the stock engines and then the modified?

Answer: NMMA members have driven the boats to see if there were any noticeable differences in the performance. There was nothing detrimental to the performance.

Question: Larry Akins, Fireboy/Xintex-What kind of converter was used?

Answer: The converters were specifically designed for the engines and the goals of the project. Two were made for each boat depending on which fit the application. There is nothing special about the catalyst itself, Dodge Durango catalysts worked with same result.

Phil Cappel-The Coast Guard would like to see this go to phase 2, which will require money and participation from the industry. If funding is available then the plan is to look into these and other issues.

Question: Kevin Bedsworth Engineering Systems, Inc. - Was there any reduction in Peak HP?

Answer: There is some hp loss. These are not high output engines, some saw a 10% reduction in peak hp. Some of the reason is the setup of the exhaust. Changing the setup can change HP output. However, the HP change has not been noticed.

Question: David Marlow, Brunswick Boat Group – Is there a plan in place for salt water testing?

Answer: There is no plan right now due to funding.

John McKnight, NMMA - In the new CARB ruling salt and fresh water testing are included.

Question: David Marlow, Brunswick Boat Group – How has the heat coming from catalyst been addressed?

Answer: Performance of the catalyst depends on a constant temperature of 165°, a water jacket takes care of the heat issue, the problem is the catalyst cooling too rapidly. There is an air jacket around the catalyst as well.

Question: David Marlow, Brunswick Boat Group – Could you speak to failure modes and indication devices to see if the catalyst is working or not?

Answer: Failures are cracking, loss of coating, failure of the materials. Salt water could coat the catalyst, in essence, poisoning the catalyst. The water jacket may keep it from failing (cracking) due to heating and cooling issues. Condensation of the exhaust gasses in the waterjacketed portion is an issue that has come up. Indication of performance is another issue. Using an O2 sensor behind the catalyst is impractical right now due to the possibility of the water intrusion. Before the catalyst there are some special sensors that may work, this is an ongoing issue.

Question: Sebastian Strauss, Bombardier - Are cold start tests planned?

Answer: This is part of the durability testing, the boats are in the water as much as possible.

Mike Samulski, representing the Environmental Protection Agency, was asked the next question:

What is the EPA assessment of current rulemaking for HC and NOX, and is there a plan to implement rules specific to recreational marine CO emissions?

(Note: Mr. Samulski's PowerPoint presentation is attached as Appendix B.)

Catalyst based standards for 25hp engines and up are in the future. The plan is to look into new standards for all craft, not just focusing on one type, style or use. Southwest Research did do one day of saltwater testing with very hard engine use. However, it was only one day and the converters were not effected.

Question: David Montgomery, Bombardier – CO measurements are in grams per kw/hr. instead of concentration. It seems that concentration levels would be more beneficial.

Answer: Separate idle standards may be the answer to address both levels.

Scott Earnest, NIOSH- Emissions data needs to be linked to exposure.

Mark Riechers, Mercury Marine was asked the following question:

What is the marine industry doing in the coming years that will impact the co emissions from marine engines?

Mr. Riechers stated that his comments are strictly related to propulsion engines because of the perspective of his company. Currently, Mercury Marine is looking at closed loop systems, catalytic converters, and Onboard Diagnostics. The fact is, technology better work the way it claims, and if it doesn't, there needs to be a way to alert the operator. There are many hurdles that go along with this type of technology. Automotive

applications have not had to deal with the variables that exist in the marine environment. Water cooled exhaust, temperature fluctuations, salt-water issues and the nature of marine engines to name a few. Marine engines are unique and run at different level at all times. The product needs to be reliable and durable while keeping everything safe. The auto industry has had 30 years to work on this problem. When catalytic converters were first introduced, they were a disaster. The key to approaching this issue is to work hard to get it right the first time. The user should notice no down time or operational problems. Within the 2008 time frame California emissions levels will necessitate the use of catalytic converters.

Sebastian Strauss, Bombardier – ICOMIA ran tests at idle speeds after the boat was hot. Maybe testing should be conducted this way. Testing needs to focus more on the way an owner uses the boat.

Mr. Blackman introduced Tom Sutherland from Westerbeke to discuss the recent release of a 99% CO free generator set.

Tom Sutherland: Progress has been made since the CO workshop in October. Westerbeke's line of "Safe CO Gensets" is now in pre-production mode but is on display here at the Miami Boat Show. This product is able to reduce the CO by 99% or more. The "Safe CO" feature will be available on the 2, 3, and 4 cylinder models. These products should be available by the end of the summer 2004. Westerbeke is also working on programs to educate the public. Education more than anything is the key to CO awareness, anyone who sells a product that emits CO should be educating the buyer. Mr. Sutherland added that EFI is part of the 'Safe CO" technology, but, mentioned that the technology behind the product cannot be released.

Mr. Blackman opened the floor to take any questions or comments for the panelists or other CO topics:

Rick Lee, Fineline industries/Centurion Boats – The sport of Wake Surfing needs to be differentiated against "Teak Surfing." Devices that divert the exhaust make this activity safe.

Dr. Robert Baron, Medical Advisor, National Park Service - Is a boat without this feature dangerous?

Rick Lee, Fineline industries/Centurion Boats -There are no documented cases of CO poisoning during this activity. It may not be an issue, there are tests on-going to determine this.

Tom Sutherland-Westerbeke-Education is the key; CO information is included with every unit shipped. Maybe at the dealer level the education is more effective.

Jim Emmons, Waterski magazine – Water Sports Industry Association adopted a policy to change the name of “teak surfing” to “platform dragging”. The WSIA is asking officially that the term “teak surfing” be changed to “platform dragging.”

Mark Riechers, Mercury Marine -The message needs to stay the same that exhaust is bad even with the technology advances. Exhaust should not be seen as “safe” in any case.

John Ford, Centek - Some people have the idea that when exhaust gasses are passed through water it is cleaned. This is not the case.

Dr. Robert Baron, Medical Advisor, National Park Service -How does Westerbeke stand on HC/NOX?

Tom Sutherland-Westerbeke -That is taken care of at the same time.

Dr. Robert Baron, Medical Advisor, National Park Service –(directed toward Mr. Samulski) As an EPA rep, HC/NOX are hazards as well as CO which is the key focus?

Mike Samulski, EPA - Trade off between CO and HC/NOX is not clear. Plan to consider need for CO control in upcoming rule.

Sheldon Graber, Destination Yachts - Education is the key even with advances in technology.

Phil Cappel, USCG - CO can still be a problem on a diesel engine; this is a topic that has not been focused on.

Sherry Kuntz, Strategic Safety - Are there any measures of the effectiveness of the media campaign that the Coast Guard has launched?

Dick Blackman, USCG - Anecdotal stories and circulation numbers, but no solid effects as of yet.

Sherry Kuntz, Strategic Safety - Used boats need to be addressed. This is an area without dealer intervention.

Dick Blackman, USCG - Adding CO requirements to existing boating safety campaigns will help in this effort.

Sebastian Strauss, Bombardier - Has anyone looked into having a co brochure at the time of registration or launching?

Dick Blackman, USCG - It is felt that the information is lost, as people are getting ready to use their boat.

Dr. Robert Baron, Medical Advisor, National Park Service -2000 was when the problem was addressed, 2001 and 2002 were statistically worse than 2000 even with the education blitz, cutting it off at the source is the only answer.

Moderator Richard Blackman thanked everyone for their participation in the meeting and the meeting was adjourned at 11:45 AM EST.

Appendix A – USCG CO Follow-up Meeting – Contact List

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